Health Advisory:

Rabies Threat in Missouri

June 2, 2016

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Health Advisories provide important information for a specific incident or situation, including that impacting neighboring states; may not require immediate action.

Health Guidances contain comprehensive information pertaining to a particular disease or condition, and include recommendations, guidelines, etc. endorsed by DHSS.

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Health Advisory
June 2, 2016

FROM: **PETER LYSKOWSKI, ACTING DIRECTOR**

SUBJECT: **Rabies Threat in Missouri**

Current Situation

Animal rabies occurs year-round in Missouri, but has its highest incidence during late-spring, throughout the summer, and into early-fall since wild animals are most active during these seasons. Increased human outdoor activity coincides with that of wild animals during these warmer months, resulting in significant opportunities for people to be exposed to the rabies virus. People can also be exposed to rabies by encountering stray dogs and cats in the community, by wild animals (such as bats) entering homes, and by unvaccinated dogs and cats that have been allowed to roam freely bringing it into the household. Persons bitten by any mammal or otherwise possibly exposed to rabies virus should be evaluated by a medical provider to determine if rabies post-exposure prophylaxis (RPEP) is indicated. Patients who have experienced a bite from an animal should also receive additional standard medical care as needed, such as thorough wound cleansing, antibiotic coverage, and assessment of tetanus vaccination status. The purpose of this health advisory is to: 1) emphasize the importance of conducting a rabies risk assessment following the potential exposure of a patient to rabies virus; 2) review risk factors of rabies transmission as they relate to decisions regarding the need for RPEP; 3) provide guidance and support in the medical follow-up of suspect cases of human rabies; and 4) to list resources available to health care providers and others involved with the prevention of human rabies.

Incidence of Rabies in Missouri

Rabies is endemic in wildlife in Missouri, the main reservoirs being bats and skunks. Approximately 45 rabid wild and domestic animals are detected annually in Missouri. However, this number underestimates the true incidence since testing is only conducted in situations where a public health or medical decision needs to be made. Over the past ten years (2006-2015), bats have accounted for about 71 percent of the rabid animals detected while skunks accounted for approximately 26 percent. Other rabid animals detected during this ten-year period included six cats, five horses, five dogs, and one cow. Rabid bats may be found anywhere in Missouri. Rabid skunks may also be found anywhere in the state, but most detections occur in the southern half of Missouri.

From January 1 – June 2, 2016, a total of nine rabid animals were detected, including six bats, one skunk, one cow, and one dog. Rabies in any animal presents a risk to people, but a rabid domestic animal represents a serious and imminent public health threat. A total of 35 persons with documented or potential exposure to the rabid cow and dog received RPEP or rabies booster vaccinations. Additional information pertaining to rabies in Missouri may be found at http://health.mo.gov/living/healthcondiseases/communicable/rabies/index.php .

Unfortunately, two Missouri residents have died of rabies in the past seven years. One case involved a Texas County resident who was bitten by a bat and who failed to seek medical

treatment following the bite. A complete description of this case can be found in the Centers for Disease Control and Prevention's Morbidity and Mortality Weekly Report (MMWR), November 6, 2009/58(43);1207-1209 (www.cdc.gov/mmwr/preview/mmwrhtml/mm5843a3.htm). A second case involved a Miller County man who died in 2014. No specific exposure was identified in this situation, but infection with a rabies virus variant associated with the tri-colored bat (*Perimyotis subflavus*) was confirmed by CDC. A description of this case can be found in the *MMWR*, March 18, 2016/65(10); 253-256 (http://www.cdc.gov/mmwr/volumes/65/wr/mm6510a1.htm?s_cid=mm6510a1_w).

Rabies Risk Assessment

1. Rabies risk assessments should be conducted in accordance with *Human Rabies Prevention – United States, 2008, Recommendations of the Advisory Committee on Immunization Practices* (www.cdc.gov/mmwr/PDF/rr/rr5703.pdf) and *Use of a Reduced (4-Dose) Vaccine Schedule for Postexposure Prophylaxis to Prevent Human Rabies, Recommendations of the Advisory Committee on Immunization Practices* (www.cdc.gov/mmwr/pdf/rr/rr5902.pdf).

2. Persons with possible rabies exposure should be evaluated as soon as possible by a health care provider. Providers are encouraged to consult with local and state health officials regarding the need for RPEP. RPEP is normally considered to be an urgent medical issue and not usually an emergency. Therefore, it can sometimes be delayed until rabies testing or clinical observation of the biting animal during a quarantine period is completed. Whether the animal is tested or placed under quarantine depends upon the species of biting animal and other risk factors as described below. This approach helps ensure that only persons with actual or highly suspected rabies exposure are given RPEP, thus avoiding unnecessary medical intervention while also saving money and conserving limited resources.

3. Variables to consider when conducting a rabies risk assessment include the type of exposure (bite or non-bite), species of biting animal, severity and location of the wound, and circumstances surrounding the incident (provoked or unprovoked).

    a) Type of Exposure (Bite or Non-bite): Rabies is carried and transmitted only by mammals. Bite wounds are the most common means of rabies transmission and require RPEP more often than non-bite exposures. Even a minor wound is sufficient to allow introduction of the rabies virus. This can be particularly problematic regarding bites from bats, since their small, needle-like teeth can leave a wound so small as to go unnoticed (for example, if the person is a very sound sleeper) or to be disregarded by the person as "insignificant" (this problem is compounded by evidence that some bat-related rabies viruses might be able to establish infection after inoculation into superficial epidermal layers of the skin). Non-bite exposures include the introduction of saliva or other infectious material into a fresh, open wound or across a mucous membrane. **The combination of human rabies vaccine and human rabies immunoglobulin (HRIG) is recommended for both bite and non-bite exposures, with the exception of persons "previously vaccinated" (see below) who do not receive HRIG.** Intact skin is an effective barrier to the rabies virus, and the virus would not be expected to cross through a scabbed-over wound. The only infectious materials in a rabid animal are saliva and nervous tissues. Blood, urine, and feces from a rabid animal are not infectious.

    b) Species of Biting Animal:

        1) Skunks are the terrestrial carnivores most often infected with rabies in Missouri. Foxes, coyotes, and raccoons are also relatively susceptible to rabies, but are not a reservoir species as are skunks. Suggestive clinical signs of rabies among wildlife cannot be interpreted reliably. All bites by such wildlife should be considered possible exposures to rabies virus. RPEP should be initiated as soon as possible following exposure to such wildlife, unless the animal is available for diagnosis and

public health authorities are facilitating expeditious laboratory testing, or if the brain tissue from the animal has already tested negative. Wild terrestrial carnivores that are available for diagnostic testing should be euthanized as soon as possible (without unnecessary damage to the head), and the brain should be submitted for rabies testing. If the results are negative, RPEP is not necessary. Other factors that might influence the urgency of decision-making regarding the initiation of RPEP before diagnostic results are known include the general appearance and behavior of the animal, whether the encounter was provoked by the presence of a human, and the severity and location of bites.

2) Bat-related strains are the most common rabies virus variants responsible for human rabies in the United States; therefore, any potential exposure to a bat requires a thorough evaluation. If the evaluation finds the person experienced a known exposure or "significant potential exposure" (see below, "Testing of Animals for Rabies"), any bats involved should be safely collected, humanely euthanized, and submitted to the Missouri State Public Health Laboratory (MSPHL) for rabies testing. Less than 1% of bats in the wild are rabid and only about 3% of the bats submitted to MSPHL for testing are found to be rabid. Timely diagnostic assessments rule out the need for unnecessary prophylaxis. The risk of rabies resulting from an encounter with a bat might be difficult to determine because of the limited injury inflicted by a bat bite (compared with more obvious wounds caused by the bite of terrestrial carnivores), an inaccurate recollection of a bat encounter that might have occurred several weeks or months earlier, and evidence that even a minor wound is sufficient for the transmission of some bat strains of rabies virus. For these reasons, any direct contact between a human and a bat should be evaluated for an exposure. If the person can be reasonably certain a bite, scratch, or mucous membrane exposure did not occur, or if the bat was tested and found to be negative for the presence of rabies virus, RPEP is not necessary.

   Other situations that might qualify as exposures include finding a bat in the same room as a person who might be unaware that a bite or direct contact had occurred (e.g., a deeply sleeping person awakens to find a bat in the room or an adult witnesses a bat in the room with a previously unattended child, mentally disabled person, or intoxicated person). These situations should not be considered exposures if rabies is ruled out by diagnostic testing of the bat, or circumstances suggest it is unlikely that an exposure took place. Other household members who did not have direct contact with the bat or were awake and aware when in the same room as the bat should not be considered as having been exposed to rabies. Circumstances that make it less likely that an undetected exposure occurred include the observation of bats roosting or flying in a room open to the outdoors, the observation of bats outdoors or in a setting where bats might normally be present, or situations in which the use of protective covers (e.g., mosquito netting) would reasonably be expected to preclude unnoticed contact. Clustering of human cases associated with bat exposures has never been reported in the United States (e.g., within the same household or among a group of campers where bats were observed during their activities). **In the event that RPEP is indicated in the absence of a visible wound (e.g., presumed bat bite), the combination of human rabies vaccine and HRIG is recommended, with the exception of persons "previously vaccinated" (see below) who do not receive HRIG. When HRIG is given under these circumstances, it should be injected intramuscularly (IM) in divided doses at sites distant from vaccine administration.**

3) Rodents and lagomorphs (rabbits and hares), either wild or domestic, present a very low risk for rabies exposure to humans. While the Centers for Disease Control and Prevention (CDC) reports a very small number of rabid wild rodents/lagomorphs each year, there have been no documented cases of transmission of rabies from any of these species to humans in the United States. Each rodent/lagomorph bite to a person should be evaluated individually, but RPEP is rarely indicated (even when the biting animal is not available for testing). A possible exception is when the biting rodent is a large species, such as a groundhog or beaver. These species might be large enough to

survive the attack by another rabid animal and eventually develop rabies and pose a risk. Neither of these species has been found rabid in Missouri. Medical providers should consult with local or state public health officials as needed regarding bites from rodents and lagomorphs.

4) Dogs, cats, ferrets, and equids (horses, donkeys, mules, zebras) that have bitten a person may be quarantined for a ten-day period. The animal must be free of signs of rabies and the incident must have been provoked for the animal to be quarantined. An unprovoked attack by an animal might be more likely than a provoked attack to indicate that the animal is rabid. Bites inflicted on a person attempting to feed or handle an apparently healthy animal should generally be regarded as provoked. The animal does not have to have a current rabies vaccination to be quarantined. Animals without a current rabies vaccination that inflict a provoked bite should be quarantined under the supervision of the local health or animal control authority at a veterinary facility or animal impoundment facility. Situations in which an animal without a current rabies vaccination inflicts an unprovoked bite should be assessed by health authorities after the animal has been evaluated by a veterinarian to determine if rabies testing is needed in lieu of quarantine. Animals with current rabies vaccinations should still be quarantined for a ten-day period since no vaccine is 100% effective, but these quarantines can typically be conducted at the animal owner's home under the supervision of the local health or animal control authority. The ten-day quarantine period begins with the date of the bite. If the animal is healthy at the end of this period, the patient does not need RPEP and the animal can be released from quarantine. If signs suggestive of rabies develop during the quarantine period, RPEP of the bite victim should be initiated. The animal should be tested for rabies and, if results are negative, RPEP can be discontinued. If the animal is a stray or no longer wanted by the owner, it can be euthanized and tested for rabies in lieu of the ten-day quarantine. Quarantine of other domestic animals (e.g., cattle) is determined on a case-by-case basis through consultation with local or state public health officials. Quarantine periods are not recognized for wild animals or wild-domestic animal crosses (for example, wolf-dog hybrids); they are, instead, euthanized and tested for rabies. Quarantine or euthanasia/testing should be used to rule out the need for RPEP whenever possible to avoid needless treatment of animal bite victims.

c) Severity and Location of the Wound: The deeper the wound and closer to the central nervous system (or highly innervated tissue, such as in the hand), the shorter the incubation period (and hence, the more quickly a decision must be made whether to initiate RPEP). There is no specified time period within which RPEP must be initiated to be effective; however, RPEP should begin as soon as possible after a thorough risk assessment has been conducted and the need for RPEP established. The average incubation period for rabies in humans is one to three months, but can range out to many months or even years (CDC has recorded two human cases with seven-year incubation periods). **If indicated, RPEP should be administered regardless of the length of any delay, provided the patient is not symptomatic. This includes the administration of both human rabies vaccine and HRIG, with the exception of persons "previously vaccinated" (see below) who do not receive HRIG.**

d) Circumstances Surrounding the Incident (Provoked or Unprovoked): This should be assessed from the "perspective" of the animal and not the patient (e.g., a person's movements in reaching out to pet a dog could be perceived as an aggressive action by the animal, resulting in a defensive bite). An "unprovoked" bite could be a symptom of rabies or it could result from another cause, such as other disease, the animal's individual disposition, or aggressive training by the owner. Many human/animal encounters are "provoked" by the person, such as approaching stray dogs/cats and feeding or handling wild animals.

Testing of Animals for Rabies

In Missouri, animal rabies testing is conducted only at MSPHL in Jefferson City. Specimens are normally prepared for submission by veterinarians, animal control agencies, or several of the larger local health departments that have veterinarians on staff. These entities are equipped to properly prepare the animal sample and have approved shipping containers designed for rabies specimen submission. Laboratory policy requires that only the animal head be submitted, except for bats and small rodents. MSPHL provides a free courier service that picks up boxed specimens each weekday from local health departments and select other facilities. Test results are normally available within one working day after delivery to the laboratory. There is no charge for testing, specimen boxes, or courier service. A charge could be incurred if a veterinarian is involved with specimen preparation. Payment of such charges varies by situation (for example, the owner – if there is one – normally pays for veterinary services). **Rabies testing should be requested only in those situations where a public health or medical decision needs to be made. Specimens should not be submitted purely for surveillance purposes or at the insistence of persons with a perceived but unfounded rabies risk. The DHSS policy letter with criteria for specimen submission (including the definition of "significant potential exposure," may be found at** www.health.mo.gov/lab/pdf/rabies_testing_policy.pdf**. Instructions for submitting specimens and complete animal rabies testing information (including a list of courier pick-up sites) may be found at** www.health.mo.gov/lab/rabies.php**.**

Treatment of Wounds

Immediate gentle irrigation with water or a dilute water povidone-iodine solution markedly decreases the risk for viral and bacterial infection following bite wounds. Wound cleansing is especially important in rabies prevention because thorough wound cleansing alone without other RPEP markedly reduces the likelihood of rabies in animal studies. Consideration should be given to the need for a booster dose of tetanus vaccine. Decisions regarding the use of antibiotic prophylaxis and primary wound closure should be individualized on the basis of the exposing animal species, size and location of the wound(s), and time interval since the bite. Suturing should be avoided, when possible.

RPEP: General Considerations

1. RPEP is indicated for persons with a known exposure or "significant potential exposure" (see above, "Testing of Animals for Rabies") to a rabid animal. Except in extremely high-risk situations, RPEP does not need to be immediately initiated if the biting animal is available for rabies testing or quarantine. A negative rabies test means the patient does not require RPEP. Quarantines apply only to dogs, cats, ferrets, and equids (horses, mules, donkeys, zebras). Other domestic animals may be quarantined on a case-by-case basis after consultation with local or state public health officials. Wild animals and wild/domestic animal crosses are not quarantined; instead, they are euthanized and tested.

2. Administration of RPEP is typically a medical urgency, not a medical emergency. Although RPEP has not always been properly administered in the United States, no failures have been documented since current biologics have been licensed. RPEP should always include both vaccine and HRIG, with the exception of persons who have been "previously vaccinated" (see below); these persons do not receive HRIG.

3. For previously vaccinated persons (see below) who are exposed to rabies, determining the rabies virus neutralizing antibody titer for decision-making about prophylaxis is NOT appropriate.

4. Two rabies vaccines are available for use in the United States; either can be administered with HRIG at the beginning of RPEP. Testing of patients completing RPEP is not necessary to document seroconversion unless the person is immunosuppressed.

5. Rabies vaccines are approved and licensed for use in dogs, cats, ferrets, horses, cattle, and sheep. Rabies is rare in properly vaccinated animals. By Missouri statute, rabies vaccine must be administered by a licensed veterinarian. Rabies vaccines are available to the general public and some persons choose to vaccinate their own pets. However, due to the many variables involved in achieving and maintaining a protective vaccination response in animals, the rabies vaccination history of an animal is considered dependable for making RPEP decisions only when vaccine has been administered by a licensed veterinarian. There are no vaccines licensed for use in other domestic animals or for any wild animals or wild/domestic animal crosses.

Rabies Post-Exposure Prophylaxis Schedule

Reference: *Use of a Reduced (4-Dose) Vaccine Schedule for Postexposure Prophylaxis to Prevent Human Rabies, Recommendations of the Advisory Committee on Immunization Practices*, Table 3. Rabies PEP Schedule – United States, 2010 (www.cdc.gov/mmwr/pdf/rr/rr5902.pdf).

Vaccination Status	Intervention	Regimen*
Not previously vaccinated	Wound cleansing	All RPEP should begin with immediate thorough cleansing of all wounds with soap and water. If available, a virucidal agent (e.g., povidone-iodine solution) should be used to irrigate the wounds.
	Human rabies immune globulin (HRIG)	Administer 20 IU/kg body weight. If anatomically feasible, the full dose should be infiltrated around and into the wound(s), and any remaining volume should be administered at an anatomical site (IM) distant from vaccine administration. Also, HRIG should not be administered in the same syringe as vaccine. Because HRIG might partially suppress active production of rabies virus antibody, no more than the recommended dose should be administered. HRIG should be administered on day 0[§]. If HRIG was not given when vaccination was begun, it can be given up to and including day 7 of the RPEP series.
	Vaccine	Human diploid cell vaccine (HDCV) or purified chick embryo cell vaccine (PCECV) 1.0 mL, IM (deltoid area[†]), 1 each on days 0[§], 3, 7, and 14[¶].
Previously vaccinated**	Wound cleansing	All RPEP should begin with immediate thorough cleansing of all wounds with soap and water. If available, a virucidal agent (e.g., povidone-iodine solution) should be used to irrigate the wounds.
	HRIG	HRIG should not be administered.
	Vaccine	HDCV or PCECV 1.0 mL, IM (deltoid area[†]), 1 each on days 0[§] and 3.

* These regimens are applicable for persons in all age groups, including children.

[†] The deltoid area is the only acceptable site for vaccination for adults and older children. For younger children, the outer aspect of the thigh may be used. Vaccine should never be administered in the gluteal area (this contraindication does not apply to administration of HRIG).

[§] Day 0 is the day dose 1 of vaccine is administered.

[¶] For persons with immunosuppression, RPEP should be administered using all 5 doses of vaccine on days 0, 3, 7, 14, and 28.

****** Any person who has ever received one of the complete pre-exposure or post-exposure regimens of HDCV, PCECV, or rabies vaccine adsorbed (RVA; RVA is no longer available in the U.S.), or previous vaccination with any other type of rabies vaccine and documented history of antibody response to the prior vaccination.

RPEP Consultation With Local or State Health Departments

Assistance with animal bite/potential rabies exposures may be obtained from local public health agencies (see www.health.mo.gov/living/lpha/lphas.php for a list of local public health agencies and contact information) or from the Missouri Department of Health and Senior Services (DHSS), Monday through Friday, 8:00 AM to 5:00 PM, telephone 573/526-4780; after hours and weekends telephone 800/392-0272 (24/7). When consulting with local or state public health officials, medical providers should have the following information available:

1. Type of exposure (examples: bite, mucous membrane, "bat in the house," etc.).
2. Circumstances surrounding the incident (example: child petting stray cat).
3. Date of incident.
4. Nature of wound (puncture versus scratch, location on body, severity, etc.).
5. Species of animal involved.
6. Patient name, address, telephone number.
7. Animal owner (if applicable) name, address, telephone number.
8. Location of animal following incident.
9. Apparent health and behavior of animal.
10. Rabies vaccination status of animal, if applicable (rabies vaccines are licensed only for dogs, cats, ferrets, horses, cattle, and sheep).
11. Has patient been "previously vaccinated" against rabies? (See "Rabies Post-Exposure Prophylaxis Schedule" above.)

Deviations From Recommended RPEP Vaccination Schedule

Every attempt should be made to adhere to the recommended vaccination schedule. Once vaccination is initiated, delays of a few days for individual doses are unimportant, but the effect of longer lapses of weeks or more is unknown. Most interruptions in the vaccine schedule do not require reinitiation of the entire series. For most minor deviations from the schedule, vaccination can be resumed as though the patient were on schedule. For example, if a patient misses the dose scheduled for Day 3 and presents for vaccination on Day 5, the Day 3 dose should be administered that day and the schedule resumed, maintaining the same interval between doses. In this scenario, the remaining doses would be administered on days 9 and 16. When substantial deviations from the schedule occur, immune status should be assessed by performing serologic testing 7–14 days after administration of the final dose in the series.

RPEP Precautions

Immunosuppressive agents, antimalarials, and immunosuppressive diseases can interfere with active immunity following vaccination. Immunosuppressive agents should not be administered during RPEP unless essential for the treatment of other conditions. When RPEP is administered to an immunosuppressed person, one or more serum samples should be tested for rabies virus neutralizing antibody to ensure that an acceptable antibody response has developed. If no acceptable antibody response is detected, the patient should be managed in consultation with appropriate public health officials.

RPEP Contraindications

Persons who have a history of serious hypersensitivity to components of rabies vaccine or to other vaccines with components that are also present in rabies vaccine should be revaccinated with caution. Dietary intolerance to eggs is not a contraindication to immunization with human rabies vaccine. Because of the potential consequences of inadequately managed rabies exposure, pregnancy is not considered a contraindication to RPEP. Studies have indicated no increased incidence of abortion, premature births,

or fetal abnormalities associated with rabies vaccination. Rabies exposure or the diagnosis of rabies in the mother should not be regarded as reasons to terminate the pregnancy.

Sources of Human Rabies Vaccine and HRIG

Human rabies vaccine and HRIG are not available through DHSS and are typically not available through local public health agencies. Local public health agencies might be a source for human rabies vaccine (doses 2 through 4 or 5) after the decision has been made that RPEP is indicated and after the Day 0 regimen (i.e., HRIG and initial rabies vaccination) has been given by a medical provider. There is normally a charge by local public health agencies for human rabies vaccine. Medical providers may contact their local public health agency to determine if vaccine is available through the latter. Contact information for local public health agencies can be found at www.health.mo.gov/living/lpha/lphas.php. Medical providers and pharmacies can order human rabies vaccine and HRIG directly from manufacturers and distributers. Product and contact information is provided in the following table:

Currently Available Rabies Biologics – United States		
Human Rabies Vaccine	**Product Name**	**Manufacturer**
Human diploid cell vaccine (HDCV)	Imovax® Rabies	Sanofi Pasteur Telephone: 800/822-2463 www.sanofipasteur.us/vaccines
Purified chick embryo cell vaccine (PCECV)	RabAvert®	GlaxoSmithKline Telephone: 800/244-7668 www.GSK.com
Rabies Immunoglobulin	**Product Name**	**Manufacturer**
	Imogam® Rabies-HT	Sanofi Pasteur Telephone: 800/822-2463 www.sanofipasteur.us/vaccines
	HyperRab™ S/D	Grifols USA Telephone: 800/243-4153 www.grifols.com/en/web/eeuu/bioscience/-/product/hyperrabb_s_d_rabies_immune-globulin

For information regarding human rabies vaccine and HRIG availability, refer to www.cdc.gov/rabies/resources/availability.html. Patient assistance programs that provide vaccine and HRIG for uninsured/underinsured patients are available; refer to www.cdc.gov/rabies/medical_care/programs.html.

Suspected Case of Human Rabies

1. Patient history, signs/symptoms, duration and progression of illness, and laboratory test results for other common etiologies of encephalitis will help determine if rabies should be on the differential diagnosis list for a patient, and thus whether ante-mortem rabies testing should be considered (see below). Patient history is important to identify a possible exposure to rabies and other encephalitides; however, rabies should never be ruled out based solely on the absence of a definite exposure history.

2. Rabies should be considered in patients with signs or symptoms of encephalitis or myelitis, including autonomic instability, dysphagia, hydrophobia, paresis, and paresthesia, particularly if a nonspecific prodrome preceded the onset of these signs by three to four days. Progressive worsening of neurologic signs is characteristic of rabies and should be considered as a positive indicator for rabies.

3. Laboratory tests to rule out common encephalitides (herpes, enteroviruses, arboviruses) should be performed. Negative results of these tests would increase the likelihood of rabies as the diagnosis. If a patient presents with symptoms similar to the ones described above, but the neurologic status does not change and the illness continues for longer than three weeks, rabies is unlikely as the diagnosis.

4. Positive Indicators for Rabies:

   a) Nonspecific prodrome prior to onset of neurologic signs.
   b) Neurologic signs consistent with encephalitis or myelitis (dysphagia, hydrophobia, paresis).
   c) Progression of neurologic signs.
   d) Negative test results for other etiologies of encephalitis.

5. Negative Indicators for Rabies:

   a) Improvement or no change in neurologic status.
   b) Illness with $\geq$ 2 to 3 week duration.

6. Laboratory Testing of Human Specimens for Rabies: Ante-mortem testing of human specimens is conducted by CDC, but submission of specimens must be coordinated through MSPHL. The Rabies Section at MSPHL may be contacted by calling 573/751-3334; after hours and weekends, call 800/392-0272 (24/7); refer also to www.health.mo.gov/lab/rabies.php. The following four samples are required by CDC to provide an ante-mortem rule out of rabies: saliva, neck biopsy, serum, cerebrospinal fluid. A rule out cannot be provided if all samples are not collected. Information regarding specimen collection/submission can be found at the following CDC website: www.cdc.gov/rabies/specific_groups/doctors/ante_mortem.html.

7. Management of Human Rabies: Clinicians faced with treating clinical rabies patients can either offer supportive therapy or an aggressive treatment plan. There is no single effective treatment for rabies once clinical signs are evident. Resources shown on the CDC website - www.cdc.gov/rabies/specific_groups/doctors/human_rabies.html - provide current research findings and thoughts regarding treatment options. They are not intended to serve as recommendations for rabies treatment. Consultation with medical staff at DHSS can be accessed by calling 573/526-4780; after hours and weekends, call 800/392-0272 (24/7).

Reportable Conditions

In accordance with 19 CSR 20-20.020, *Reporting Communicable, Environmental and Occupational Diseases* (http://s1.sos.mo.gov/cmsimages/adrules/csr/current/19csr/19c20-20.pdf), the following conditions are reportable to the local public health agency or DHSS by telephone, facsimile, or other rapid communication. Contact information for local public health agencies can be found at www.health.mo.gov/living/lpha/lphas.php. DHSS can be contacted Monday through Friday, 8:00 AM to 5:00 PM, telephone 573/751-6113; after hours and weekends, call 800/392-0272 (24/7) or fax 573/526-0235.

1. *Rabies (Human)*: Immediately upon first knowledge or suspicion.
2. *Animal (mammal) bite, wound, humans*: Within one day of first knowledge or suspicion.
3. *Rabies (Animal)*: Within one day of first knowledge or suspicion.
4. *Rabies Post-Exposure Prophylaxis (Initiated):* Within three days of first knowledge or suspicion.

"An Ounce of Prevention . . ."

To help prevent rabies exposures in your community, please refer your health education staff to the following DHSS website where they can order free educational posters: /www.health.mo.gov/living/healthcondiseases/communicable/tickscarrydisease/orderform.php

Websites

1. Missouri Department of Health and Senior Services, *Rabies Surveillance*, www.health.mo.gov/living/healthcondiseases/communicable/rabies/index.php
2. CDC, *Rabies*, www.cdc.gov/rabies
3. CDC, *Rabies- Information for Doctors*, www.cdc.gov/rabies/specific_groups/doctors/index.html
4. CDC, *Rabies- Ante Mortem Testing*, www.cdc.gov/rabies/specific_groups/doctors/ante_mortem.html
5. CDC, *Rabies-Management of Human Rabies*, www.cdc.gov/rabies/specific_groups/doctors/human_rabies.html
6. *Human Rabies---Missouri, 2008*. *CDC Morbidity and Mortality Weekly Report (MMWR)*, November 6, 2009/58(43);1207-1209, www.cdc.gov/mmwr/preview/mmwrhtml/mm5843a3.htm
7. *Human Rabies – Missouri, 2014*. CDC MMWR, March 18, 2016/65(10);253-256, http://www.cdc.gov/mmwr/volumes/65/wr/mm6510a1.htm?s_cid=mm6510a1_w

Questions regarding this Health Advisory should be directed to the DHSS Office of Veterinary Public Health at 573/526-4780 or 800/392-0272 (24/7).

Health Advisory:

Mumps Cases in Central Missouri

November 18, 2016

This document will be updated as new information becomes available. The current version can always be viewed at http://www.health.mo.gov.

The Missouri Department of Health & Senior Services (DHSS) is now using 4 types of documents to provide important information to medical and public health professionals, and to other interested persons:

Health Alerts convey information of the highest level of importance which warrants immediate action or attention from Missouri health providers, emergency responders, public health agencies, and/or the public.

Health Advisories provide important information for a specific incident or situation, including that impacting neighboring states; may not require immediate action.

Health Guidances contain comprehensive information pertaining to a particular disease or condition, and include recommendations, guidelines, etc. endorsed by DHSS.

Health Updates provide new or updated information on an incident or situation; can also provide information to update a previously sent Health Alert, Health Advisory, or Health Guidance; unlikely to require immediate action.

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Health Advisory
November 18, 2016

FROM: **PETER LYSKOWSKI, DIRECTOR**

SUBJECT: **Mumps Cases in Central Missouri**

The Columbia/Boone County Department of Public Health and Human Services and the Missouri Department of Health and Senior Services (DHSS) continue to receive reports of mumps cases among persons associated with a large university located in central Missouri. A total of 73 (31 laboratory-confirmed and 42 probable) cases of mumps have been reported as of November 18, 2016. Most cases report a symptom onset after October 27, 2016. The purpose of this DHSS Health Advisory is to alert health care providers of the outbreak of mumps among Missouri college students, and to provide guidance on clinical and laboratory diagnosis, and measures to control infection transmission.

Background

Mumps is an acute viral infection caused by the mumps virus, a member of the family *Paramyxoviridae*. Infection transmission occurs from person to person through direct contact with respiratory secretions or saliva or indirect contact through fomites. The average incubation period for mumps is 16 to 18 days, with a range of 12 to 25 days. The mumps virus has been isolated from 7 days before through 9 days after parotitis onset; however, the maximum infectiousness occurs in the 2 days before through 5 days after parotitis onset. Transmission also likely occurs from persons with asymptomatic infections and from persons with prodromal symptoms in the absence of parotitis.

The symptoms of mumps typically begin with body aches, loss of appetite, fatigue, headache, and low grade fever, and can progresses to parotitis. Parotid swelling is unilateral initially, but later becomes bilateral in the majority of cases. Earache on the side of parotitis and discomfort with eating acidic foods are common. Other salivary glands (submandibular and sublingual) under the floor of the mouth also may swell but do so less frequently. Fever usually resolves within 3 to 5 days, and parotid swelling resolves within 7 to 10 days. Morbilliform rash has been reported in mumps cases. Increased serum amylase levels can be observed during the first week of illness. One-third of mumps cases have subclinical infection or mild respiratory illness. Adolescents and adults have more severe illness than young children.

Most persons with mumps will recover completely though serious complications can occur. Complications include orchitis (testicular inflammation in males), aseptic meningitis, and rarely encephalitis, pancreatitis, deafness, and death. Mumps virus is neurotropic, but only a small fraction of cases with mumps parotitis have clinical evidence of meningitis or encephalitis. Parotitis does not develop in about half of patients with mumps meningitis. Mumps orchitis is usually unilateral, and more common in those 15 to 29 years of age. Complications of mumps infection reported in recent U.S. mumps outbreaks include: orchitis in 3.3 to 10% of adolescent and adult male cases, which may result in sterility; mastitis and oophoritis in < 1% of adolescent and adult female cases; and other rare complications in < 1% of cases. Vaccination

with the measles-mumps-rubella (MMR) and measles-mumps-rubella-varicella (MMRV) vaccines is the best way to prevent mumps. Since introduction of the vaccine, there has been a 99% decrease in mumps cases in the U.S. Two doses of the vaccine has a median 88% (range: 66% to 95%) effectiveness in protecting against mumps, while one dose is 78% (range: 49% to 92%) effective. Outbreaks can still occur in highly vaccinated U.S. communities, particularly in close-contact settings, such as attending the same class, playing on the same sports team, or living in a dormitory with a person who has mumps. In recent years, outbreaks have occurred in schools, colleges, and camps. However, high vaccination coverage helps limit the size, duration, and spread of mumps outbreaks. Persons who received 2 doses of MMR are about 9 times less likely to get mumps than unvaccinated persons who have the same exposure. If mumps infection is acquired by the vaccinated person, the disease is usually less severe, and has less complications.

Laboratory Testing

Laboratory testing should be performed if mumps is suspected. Acute mumps infection can be detected by the presence of mumps IgM in serum, a significant rise in IgG antibody titer in acute and convalescent-phase serum specimens, IgG seroconversion, positive mumps virus culture, or detection of the virus by real-time reverse transcription polymerase chain reaction (RT-PCR). Specimen collection should include a buccal or oral swab specimen in viral transport for molecular detection by RT-PCR and viral culture; **AND** blood specimens for serologic testing. The early collection of buccal swab specimens provides the best means of laboratory confirmation, particularly among suspected mumps patients with a history of vaccination. The first (acute-phase) serum sample should be collected as soon as possible upon suspicion of mumps disease. Collect 7–10 ml of blood in a red-top or serum-separator tube (SST). Convalescent-phase serum samples should be collected about 2–3 weeks after the acute-phase sample.

Please note: Laboratory testing to confirm mumps in a highly vaccinated population may be challenging, and serologic tests should be interpreted with caution as **false negative** serologic results in vaccinated persons are common. In previously vaccinated persons (particularly with 2 vaccine doses), serum mumps IgM tests results may be negative; IgG test results may be positive at the initial blood draw; and viral detection in RT-PCR or culture may have low yield if the buccal swab is collected more than 3 days after parotitis onset. Also, **false positive** IgM serology results can occur in both unvaccinated and vaccinated persons because assays may be affected by other diagnostic entities that cause parotitis.

The Missouri State Public Health Laboratory (MSPHL) provides laboratory support for the diagnosis of mumps infections occurring in Missouri. In addition, the laboratory may refer specimens to a Vaccine Preventable Disease (VPD) reference laboratory for further diagnostic testing and characterization. VPD laboratories are established in cooperation with public health laboratories and the Centers for Disease Control and Prevention (CDC) to provide reference testing and surge capacity.

Medical providers caring for a patient suspected of having mumps should contact their local public health agency (LPHA), or DHSS at 573/751-6113 or 800/392-0272 (24/7), to report the illness and discuss testing eligibility and the sending of specimens to MSPHL. **Note:** before any specimen is sent to MSPHL, DHSS must first be consulted for approval for testing as resources are limited. Information regarding mumps testing at the MSPHL is located at: http://health.mo.gov/lab/mumps.php. For additional information on laboratory testing for mumps, see: CDC Laboratory Testing for Mumps: http://www.cdc.gov/mumps/lab/index.html; CDC Questions and Answers about Lab Testing for Mumps: http://www.cdc.gov/mumps/lab/qa-lab-test-infect.html; CDC Specimen Collection, Storage, and Shipment: http://www.cdc.gov/mumps/lab/specimen-collect.html (do **NOT** ship specimens directly to CDC).

Controlling Transmission:

Health-care providers should maintain a high index of suspicion for mumps among persons with

symptoms compatible with the disease. In addition, be aware that mumps outbreaks can occur in highly vaccinated populations in high transmission settings, including schools and colleges. Therefore, mumps should not be ruled out based on evidence of mumps immunity. Promptly report suspected cases of mumps to your LPHA, or to DHSS at 573/751-6113 or 800/392-0272 (24/7).

CDC infection control recommendations for known or suspected mumps cases include: 1) isolation of persons in the community and 2) use of droplet precautions, in addition to standard precautions, in healthcare settings. These measures should be continued for 5 days after onset of parotitis. Persons who were contacts of a mumps case during the 2 days prior through 5 days after onset of parotitis should be identified, assessed for evidence of immunity (see http://www.cdc.gov/mmwr/preview/mmwrhtml/rr6204a1.htm, Table 3), and offered vaccine as appropriate. In addition, all contacts should be educated on the symptoms of mumps, instructed to watch for symptoms from 12 to 25 days after the last exposure, and told to isolate themselves and contact their medical provider and their local health department if symptoms develop.

Mumps-containing vaccine should be administered as appropriate to persons without evidence of immunity (see http://www.cdc.gov/mmwr/preview/mmwrhtml/rr6204a1.htm, Table 3). Although mumps-containing vaccination has not been shown to be effective in preventing mumps in persons already exposed to mumps virus, it will prevent infection in those persons who are not yet exposed or infected. If a person without evidence of immunity can be vaccinated early in the course of an outbreak, they can be protected prior to exposure. Given the long incubation period for mumps, cases can be expected to potentially occur for at least 25 days among newly vaccinated persons who may have been infected prior to vaccination. Immunization of infected persons during the incubation period presents no increased risk of adverse events.

Prevention and control strategies should be applied in all health care settings. These measures include: assessment of the presumptive immunity of healthcare personnel; vaccination of those without evidence of immunity when appropriate; exclusion of health care personnel with known or suspected active mumps illness, as well as health care personnel who do not have presumptive evidence of immunity who are exposed to persons with mumps; and isolation of patients in whom mumps is suspected, including implementation of droplet precautions in additional to standard precautions. It is very important to avoid sharing drinks or eating utensils, especially in high risk settings for disease transmission such as households, college campuses, and sport teams.

Guidance on mumps vaccination, including determining presumptive immunity among health care workers, is available at http://www.cdc.gov/mmwr/preview/mmwrhtml/rr6204a1.htm.

Questions should be directed to DHSS' Bureau of Communicable Disease Control and Prevention at 573/751-6113 or 800/392-0272 (24/7).

Additional Guidance

CDC Mumps for Healthcare Providers:
http://www.cdc.gov/mumps/hcp.html

Prevention of Measles, Rubella, Congenital Rubella Syndrome, and Mumps, 2013: Summary Recommendations of the Advisory Committee on Immunization Practices (ACIP):
http://www.cdc.gov/mmwr/preview/mmwrhtml/rr6204a1.htm

CDC Manual for Vaccine Preventable Diseases:
http://www.cdc.gov/vaccines/pubs/surv-manual/chpt09-mumps.html